

Chapter 3

Designating Bikeways on Highways

1. Bicycle Routes on Highways

A bicycle route is a suggested way to get somewhere. In a community, a bicycle route may consist of a set of signs designating a preferred way to get from a residential area to a park or to a shopping area. A network of such routes may show bicyclists how to get to many destinations throughout the community. In some cases, looped systems of scenic routes have been created to provide users with a series of recreational experiences.

In rural areas, signed and numbered touring routes can help long-distance bicyclists ride across the state on a network of carefully-chosen, quiet country roads. Often, such bicycle routes are keyed to a user map.

Overall, the decision to select one road over another for a bicycle route should be based on the advisability of encouraging bicycle use on that particular road. While the roads chosen for bike routes may not be completely free of problems, they should offer the best balance of safety and convenience of the available alternatives. In general, the most important considerations are pavement width and geometrics, traffic conditions, and appropriateness for the intended purpose.

Attributes which describe how appropriate a particular road is for a bicycle route include directness, scenery and available services. Directness is important for bicyclists traveling for a purpose. For recreational riders, this factor is not as important. For recreational bicyclists, on the other hand, varied and attractive scenery is one of the most important factors. Recreational riders, particularly those riding more than a few kilometers (miles), will be interested in services (food, water, restrooms). A route without such services will be less desirable than one with occasional stopping places.

a. Designating Bike Routes

When designating a bicycle route, the placement and spacing of signs should be based on Part IX of the MUTCD. For Bike Route signs to be functional, supplemental plates may be placed beneath them when located along routes leading to high demand destinations (e.g., “To Downtown,” “To State College,” etc., see Figure 24 for typical signing).

Since bicycle route continuity is important, directional changes should be signed with appropriate arrow subplaques. Also, signing should not end at a barrier. Information directing the bicyclist around the barrier should be provided.

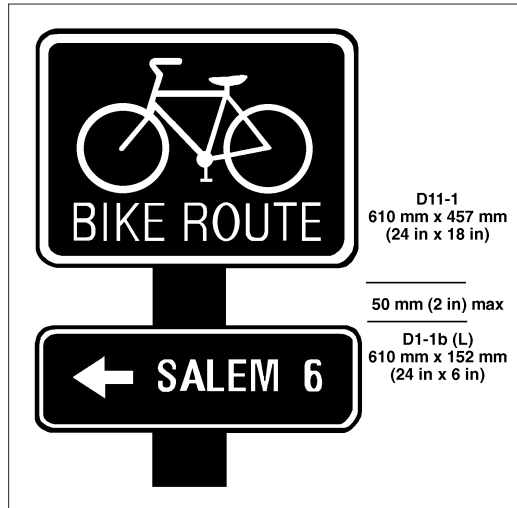
According to the MUTCD (Part 2A-6), “Care should be taken not to install too many signs. A conservative use of regulatory and warning signs is recommended as these signs, if used to excess, tend to lose their effectiveness. On the other hand, a frequent display of route markers and directional signs to keep the driver informed of his location and his course will not lessen their value.”



Bike route: The Bike Route sign (see Figure 24) is intended for use where no unique designation of routes is desired. However, when used alone, this sign conveys very little information. It should be used in conjunction with supplemental plaques giving destinations and distances. See Part 9B-22 of the MUTCD for specific information on subplate options.

Figure 24

Functional Signing



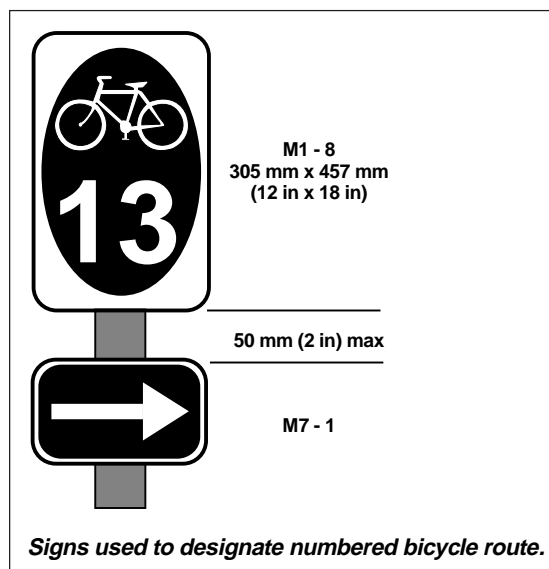
Source: Manual on Uniform Traffic Control Devices, FHWA, 1988

Numbered bike route: The numbered bike route sign (see Figure 25) is used to establish a unique identification for a state or local bicycle route. The sign may be combined with directional arrow subplates OM7-1 through M7-7.

One use of this type of sign is for long touring bicycle routes. The number may, for example, correspond to a parallel highway, indicating the route is a preferred alternate route for bicyclists. This sign also is used in communities with multiple bicycle routes.

Figure 25

Numbered Bicycle
Route Sign



Source: Manual on Uniform Traffic Control Devices, FHWA, 1988

Such signs are often used in conjunction with user maps, which tell the bicyclist where each route goes.

Numbering of bicycle routes, at the state and county level, should be coordinated with the NJDOT Bicycle/Pedestrian Advocate to assure continuity.



2. Bicycle Lanes on Highways

Bicycle lanes can be considered when it is desirable to delineate available road space for preferential use by bicyclists and motorists, and to provide for more predictable movements by each. Bicycle lane markings, as exemplified in Figure 26, can increase a bicyclist's confidence in motorists not straying into his/her path of travel. Likewise, passing motorists are less likely to swerve to the left out of their lane to avoid bicyclists on their right.

Bicycle lanes should always be one-way facilities and carry traffic in the same direction as adjacent motor vehicle traffic. Two-way bicycle lanes on one side of the roadway are unacceptable because they promote riding against the flow of motor vehicle traffic. Wrong-way riding is a major cause of bicycle accidents and violates the Rules of the Road stated in the Uniform Vehicle code. Bicycle lanes on one-way streets should be on the right side of the street, except in areas where a bicycle lane on the left will decrease the number of conflicts (e.g., those caused by heavy bus traffic). In unique situations, it may be appropriate to provide a contra-flow bicycle lane on the left side of a one-way street. Where this occurs, the lane should be marked with a solid, double yellow line and the width of the lane should be increased by 1 foot.



Source: [Guide for the Development of Bicycle Facilities](#), AASHTO, 1991

Figure 26

Bicycle Lane Markings

a. Lane Widths

Under ideal conditions, the minimum bicycle lane width is 5 feet (1.5 m). However, certain edge conditions dictate additional desirable bicycle lane width. To examine the width requirements for bicycle lanes, Figures 27, 28 and 29 show three usual locations for such facilities in relation to the roadway. Figure 27 depicts bicycle lanes on an urban curbed street where a parking lane is provided. The minimum bicycle lane width for this location is 5 feet (1.5 m). If parking volume is substantial or turnover is high, an additional 1 or 2 feet (0.3 or 0.6 m) of width is desirable for safe bicycle operation. Bicycle lanes should always be placed between the parking lane and the motor vehicle lanes. Bicycle lanes between the curb and the parking lane can create obstacles for bicyclists and eliminate a bicyclist's ability to avoid a car door as it is opened, therefore, this placement should not be considered.



Figure 27

Bicycle Lanes on an Urban Curbed Street

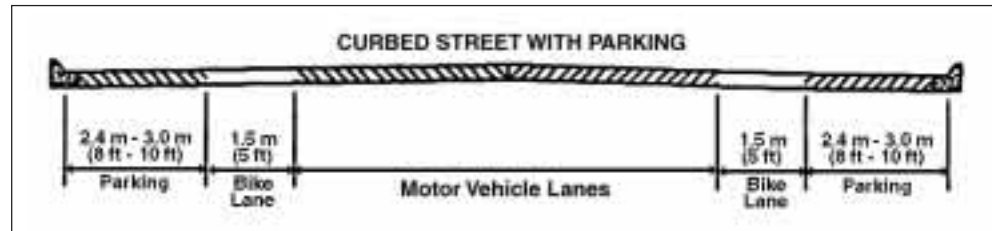


Figure 28 depicts bicycle lanes along the outer portions of an urban curbed street where parking is prohibited.

Bicyclists do not generally ride near a curb because of the possibility of debris, of hitting a pedal on the curb, of an uneven longitudinal joint, or of a steeper cross slope. Bicycle lanes in this location should have a minimum width of 5 feet (1.5 m) from the curb face. If the longitudinal joint between the gutter pan and the roadway surface is uneven and falls within 5 feet (1.5 m) of the curb face, a minimum of 4 feet (1.2 m) should be provided between the joint and the motor vehicle lanes.

Figure 28

Bicycle Lanes along the Outer Portions of an Urban Curbed Street

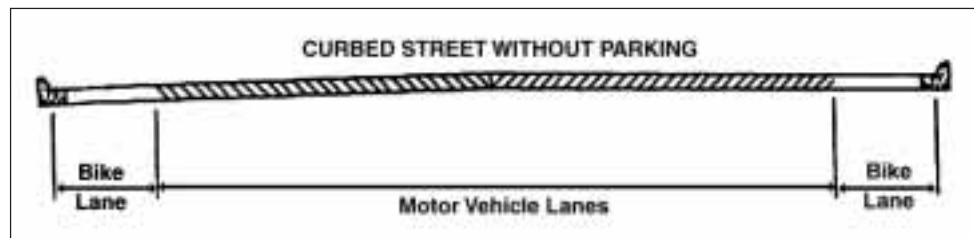
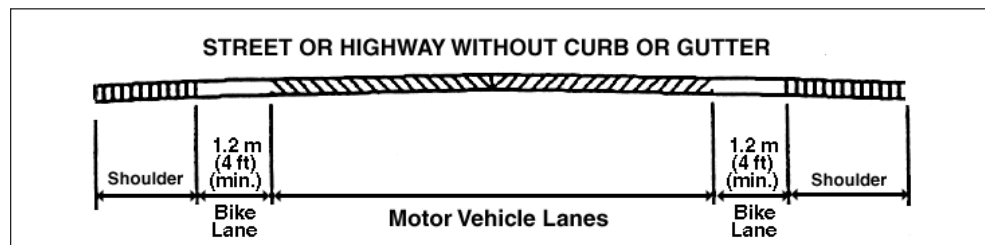


Figure 29 depicts bicycle lanes on a highway not adjacent to the curb. Bicycle lanes should be located between the motor vehicle lanes and the roadway shoulders. In this situation bicycle lanes may have a minimum width of 4 feet (1.2 m), since the shoulder can provide additional maneuvering width. A width of 5 feet (1.5 m) or greater is preferable; additional widths are desirable where substantial truck traffic is present, or where vehicle speeds exceed 40 mph. In certain situations it may be appropriate to designate the full shoulder as the bike lane.

Figure 29

Bicycle Lanes on Highway Without a Curb or Gutter



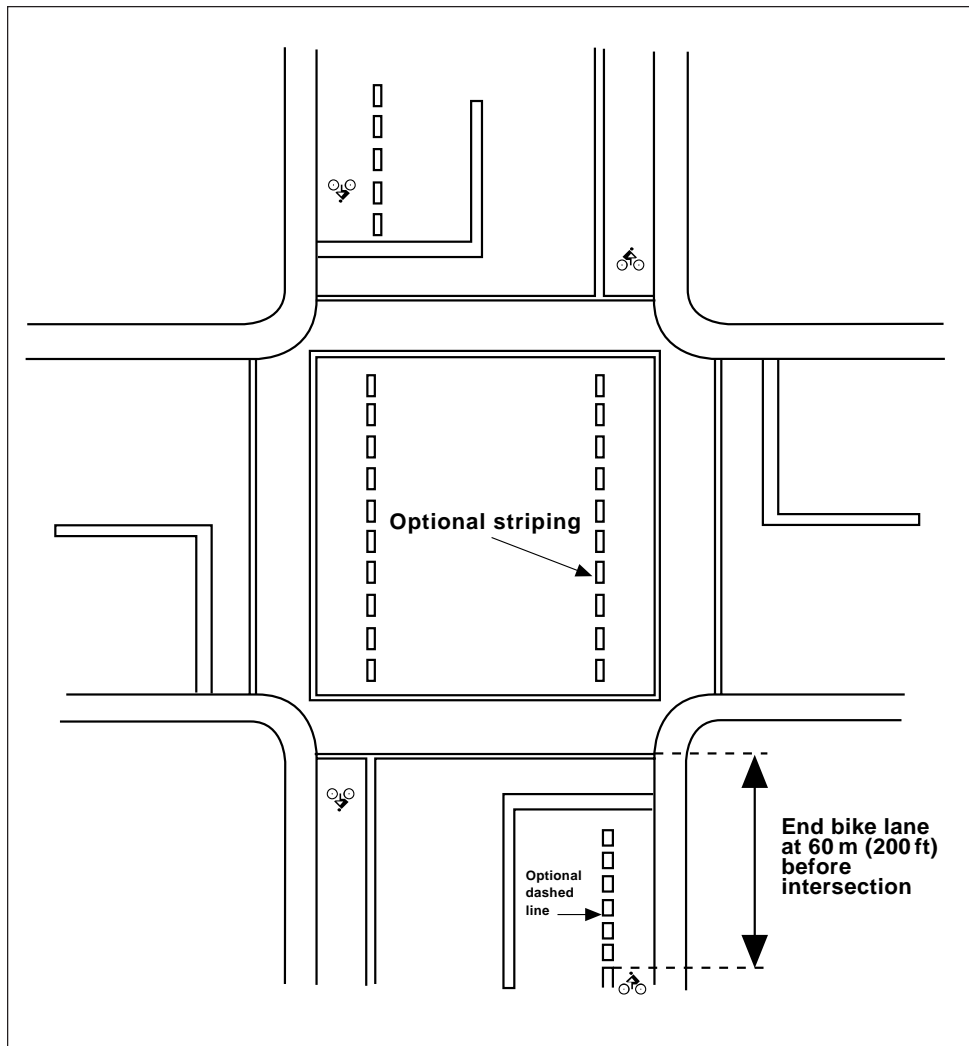
Source: Adapted from *Guide for the Development of Bicycle Facilities*, AASHTO, 1991



b. Intersections

Bicycle lanes tend to complicate both bicycle and motor vehicle turning movements at intersections. Because they encourage bicyclists to keep to the right and motorists to keep to the left, both operators are somewhat discouraged from merging in advance of turns. Thus, some bicyclists will begin left turns from the right side bicycle lane and some motorists will begin right turns from the left side of the bicycle lane. Both maneuvers are contrary to established Rules of the Road and result in conflicts.

Design treatment for bicycle lanes at simple intersections is shown in Figure 30. On a two lane highway, the edge line along the bike lane should end approximately 60 meters (200 feet) from the intersection to allow left turning bicyclists and right turning motorists to “weave.”



Source: Adapted from *Technical Handbook of Bikeway Design*, Velo, Quebec, 1992

Figure 30

Bicycle Lanes on
2 Lane Roadways
Without Turn Lanes



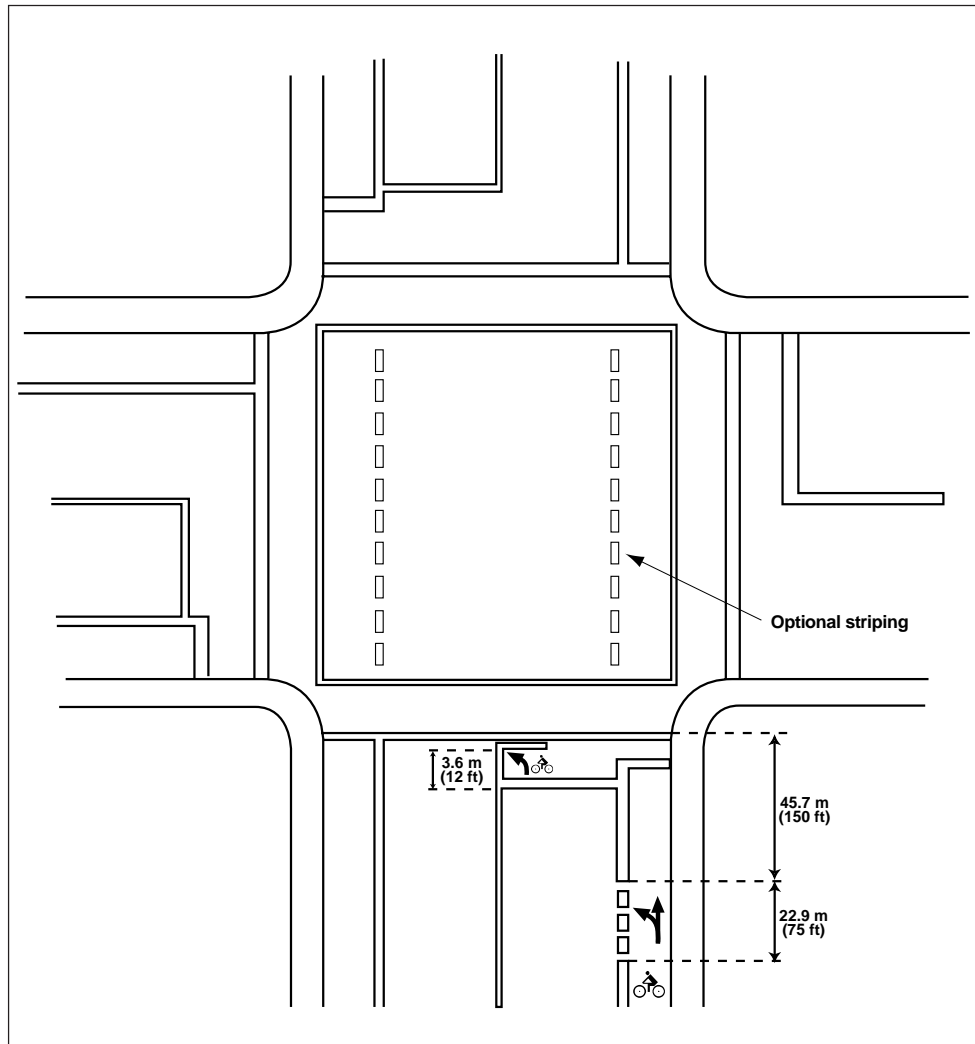
Where high volumes of bicycle traffic exist and primacy is given to bicyclists, a bicycle queuing area should be considered at the intersection as shown in Figure 31. At these intersections, the stop line for vehicles is set back to allow bicyclists to move to the front of a lane of vehicular traffic to make a left turn or proceed through the intersection.

Design treatment at multi-lane intersections is more complex. Figure 32 presents examples of details on pavement markings for bicycle lanes approaching motorist right-turn-only lanes. Where there are numerous left turning bicyclists, a separate turning lane, as indicated in the MUTCD should be considered. The design of bicycle lanes should also include appropriate signing at intersections to reduce the number of conflicts. General guidance for pavement marking of bicycle lanes is contained in the MUTCD.

Adequate pavement surface, bicycle-safe grate inlets, safe railroad crossings, and traffic signals responsive to bicycles should always be provided on roadways where bicycle lanes are being designated. Raised pavement markings and raised barriers can cause steering difficulties for bicyclists and should not be used to delineate bicycle lanes.

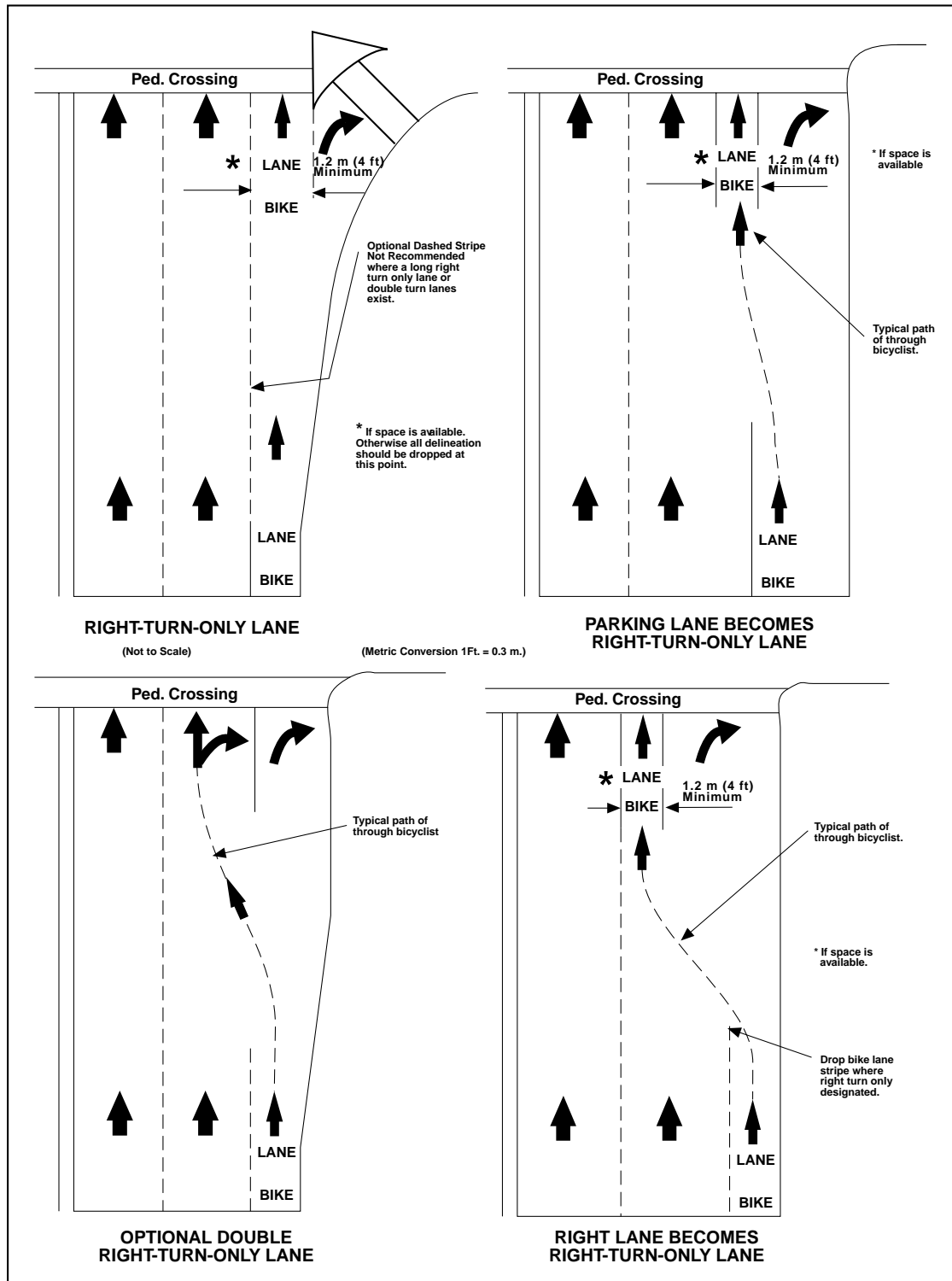
Figure 31

Optional Bicycle Queuing Area at Intersection with High Volumes



Source: Adapted from *Technical Handbook of Bikeway Design*, Velo, Quebec, 1992

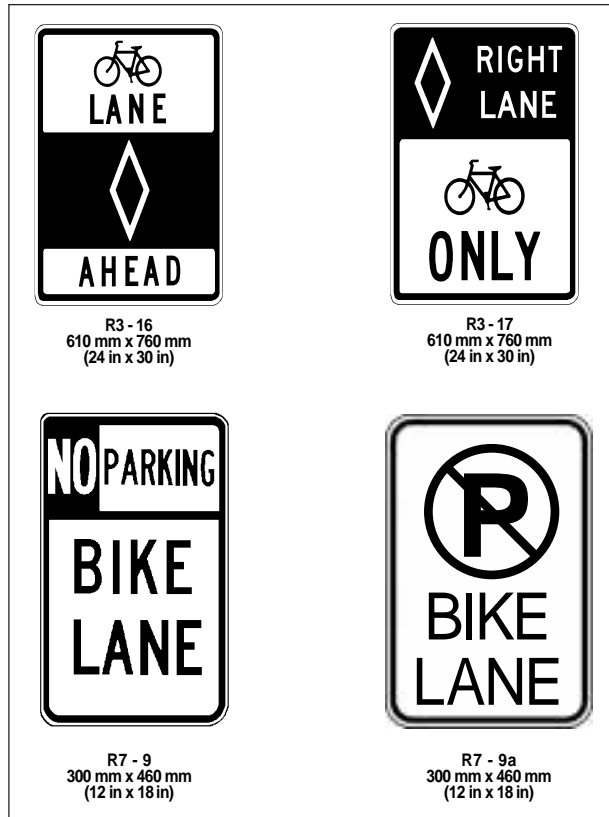


Figure 32Bicycle Lanes Approaching Motorist
Right-Turn-Only LanesSource: *Guide for the Development of Bicycle Facilities*, AASHTO, 1991

c. Signing and Striping Requirements

Signing should be in accordance with MUTCD and is shown in Figure 33. Bicycle lanes should be well-marked and signed to ensure clear understanding of the presence and purpose of the facility by both bicyclists and motorists. The MUTCD specifies standard signing for bicycle lanes. According to MUTCD, “the R3-16 sign

Figure 33
MUTCD Bicycle
Lane Signs



Source: *Manual on Uniform Traffic Control Devices*, FHWA, 1988

should be used in advance of the beginning of a marked designated bicycle lane to call attention to the lane and to the possible presence of bicyclists. The R3-16 and R3-17 signs should be used only in conjunction with the Preferential Lane symbol pavement marking and erected at periodic intervals along the designated bicycle lane and in the vicinity of locations where the preferential lane symbol is used.”

According to MUTCD, where it is necessary to restrict parking, standing, or stopping in a designated bicycle lane, appropriate signs as described in MUTCD may be used, or signs R7-9 or R7-9a shall be used.

Bicycle lane stripes should be solid, 150mm to 200mm (6 to 8 inches)

wide white lines. Care should be taken to use pavement striping that is skid resistant. Thermoplastic tape and painted markings can become slippery and cause the cyclist to fall. Impregnated grit, non-skid, preformed tape is an acceptable striping material.

It is very important to re-apply bicycle lane markings when they begin to fade, since faded bicycle lane markings can lead to confusion by motorists and bicyclists. If necessary, re-application of bicycle lane stripes should be placed on a more frequent schedule than regular roadway re-striping projects. Old markings should be removed prior to re-striping if new layers of marking materials would otherwise create raised areas that would be hazardous to bicyclists.

Preferential bicycle lane symbols should be installed on the pavement in bicycle lanes. Symbols should be installed at regular intervals (no more than 107 meters (350 feet) between symbols), immediately after intersections, and at areas where bicycle lanes begin. Pavement letters that spell “ONLY BIKE,” and arrows are optional.



3. Suitability Factors for Locating Bikeways on Highways

The suitability of a highway facility for bicycling is influenced by a number of factors. These factors can generally be classified in the following categories:

- Land Use and Location Factors
 - Physical Constraint Factors
 - Traffic Operations Factors
- a. **Land use and location factors** represent the most significant category affecting suitability. Since bicycle trips are generally shorter than trips made by other modes, there must be a manageable distance between origins and destinations such as between residential areas and places of employment. There are certain key land uses which are especially likely to generate bicycle traffic if good bicycle facilities are available. These consist of, but are not limited to transit centers, schools, employment centers with nearby residential areas, recreation areas and mixed use cities, towns and villages.
 - b. **Physical constraint factors** consist of highway geometric or physical obstacles to bicycling which are difficult or costly to remedy. For example, a roadway may be suitable because of location factors but not suitable because of the existence of physical constraints to bicycling such as a narrow bridge, insufficient ROW or intersections with restricted lane widths, as a result of lane channelization. The feasibility of ameliorating these physical constraints must be weighed in deciding the designation of bikeways.
 - c. **Traffic operations factors** include traffic volume, speed, the number of curb cuts or conflict points along the highway, sight distance, and bicycle and pedestrian sensitive traffic control devices. Experienced bicyclists will use highways despite limiting traffic operational factors. However, less confident bicyclists will perceive such highways as unsafe and intimidating. These highway facilities should be designed or improved to accommodate bicyclists through the shared use of roadways. However, they are inappropriate for designation as bikeways.

Other safety issues such as maintenance and pavement repair are also important considerations in the designation of bikeways but do not affect the planning aspects of suitable facilities.

4. Design Guidelines for Bikeways on Highways

Bicycle lanes are usually more suitable in urban settings on roads with high traffic volumes and speeds. Bicycle routes are often used in urban settings to guide bicyclists along alternate or parallel routes that avoid major obstacles or which have more desirable traffic operational factors.

In rural settings, bicycle lanes are not usually necessary to designate preferential use. On higher volume roadways, wide shoulders offer bicyclists a safe and comfortable riding area. On low volume roadways, bicyclists prefer the appearance of a narrow, low speed country road.

Table 2 recommends the type of bikeway and pavement width for various traffic conditions.

For locations where pavement widths do not meet the following criteria, the NJDOT Bicycle/Pedestrian Advocate should be notified, and can assist in the decision making process.

Where physical obstructions exist that can be removed in the future, the highway facility should be designed to meet bikeway space allocation requirements, and upgraded and designated when the physical constraint is remedied (i.e., bridge is replaced and improved to allow designated facility.)

The final design should be coordinated with the NJDOT Bicycle/Pedestrian Advocate for review and approval prior to construction.



Table 2

Bikeway Types
and Pavement
Width

Condition I
AADT 1200* - 2000

	URBAN W/PARKING	URBAN W/O PARKING	RURAL
<50 km/h (30 mph)	BR (SL) 4.2m (14 ft.)	BR (SL) 4.2m (14 ft.)	BR (SL) 3.0m (10 ft.)
50 km/h-65 km/h (31-40 mph)	BL 1.5m (5 ft.)	BL 1.5m (5 ft.)	BR (SH) 1.2m (4 ft.)
65 km/h-80 km/h (41-50 mph)	BL 1.8m (6 ft.)	BL 1.5m (5 ft.)	BR (SH) 1.8m (6 ft.)
>80 km/h (50 mph)	N/A	BL 1.8m (6 ft.)	BR (SH) 1.8m (6 ft.)

KEY: BR (SL) = shared lane, BR (SH) = shoulder, BL = bike lane

* For volumes less than 1200 AADT a shared lane is acceptable where adequate sight distance exists.

Condition II
AADT 2000 - 10,000

	URBAN W/PARKING	URBAN W/O PARKING	RURAL
<50 km/h (30 mph)	BR (SL) 4.2m (14 ft.)	BR (SL) 4.2m (14 ft.)	BR (SH) 1.2m (4 ft.)
50 km/h-65 km/h (31-40 mph)	BL 1.5m (5 ft.)	BL 1.5m (5 ft.)	BR (SH) 1.2m (4 ft.)
65 km/h-80 km/h (41-50 mph)	BL 1.8m (6 ft.)	BL 1.8m (6 ft.)	BR (SH) 1.8m (6 ft.)
>80 km/h (50 mph)	N/A	BL 1.8m (6 ft.)	BR (SH) 2.4m (8 ft.)

KEY: BR (SH) = shoulder, BR (SL) = shared lane, BL = bike lane

Condition III
AADT Over 10,000

	URBAN W/PARKING	URBAN W/O PARKING	RURAL
<50 km/h (30 mph)	BR (SL) 1.5m (5 ft.)	BR (SL) 1.5m (5 ft.)	BR (SH) 1.2m (4 ft.)
50 km/h-65 km/h (31-40 mph)	BL 1.8m (6 ft.)	BL 1.5m (5 ft.)	BR (SH) 1.8m (6 ft.)
65 km/h-80 km/h (41-50 mph)	BL 1.8m (6 ft.)	BL 1.8m (6 ft.)	BR (SH) 1.8m (6 ft.)
>80 km/h (50 mph)	N/A	BL 1.8m (6 ft.)	BR (SH) 2.4m (8 ft.)

KEY: BR (SH)=shoulder BL=bike lane



5. Integrating Bikeways Into The Highway Planning Process

Planning for bicycle facilities on highways should begin at the very earliest stage of project development on all sizes and types of highway projects. Even the smallest highway reconstruction project could result in a missed opportunity if bicyclists are not taken into consideration at the initiation of the project.

At the municipal level, planners should address these highway planning issues in the comprehensive context of the circulation element in the municipal master plan, as provided for in the New Jersey Municipal Land Use Law, N.J.S.A. 40:55D-28.b.(4).

The following procedure offers the planner and designer guidance in determining the need for bikeways during the usual phases of project development.

a. Needs Assessment

The first step in the planning process for any transportation project is the assessment of needs. Existing and planned land use, current and projected traffic levels, and the special needs of the area population are examined. There are circumstances in which a portion of the transportation need might be served by non-motorized means, as well as locations where existing bicycle demand would be better served by improved facilities. A series of questions with respect to land use and location factors are presented to assist in recognizing the potential for non-motorized travel and evaluating the needs of bicyclists at the State level.

- Does the highway serve an activity center which could generate bicycle trips?
- Is the highway facility included on a county or municipal bicycle master plan?
- Will the highway facility provide continuity with or between existing bicycle facilities?
- Is the highway facility located on a roadway which is part of a mapped bike route or utilized regularly by local bicycle clubs?
- Does the highway facility pass within 3.2 kilometers (two miles) of a transit station?
- Does the highway facility pass within 3.2 kilometers (two miles) of a high school or college?
- Does the highway facility pass within 0.8 kilometers (1/2 mile) of an elementary school or middle school?
- Does the highway facility pass through an employment center? If so, is there a significant residential area within a 4.8 kilometer (3 mile) radius?
- Does the highway facility provide access to a recreation area or otherwise serve a recreation purpose?

If any one of these criteria produces a significantly positive response, the highway facility has the potential of attracting less experienced bicycle riders and/or large numbers of advanced riders. As a result, it should be considered as potentially suitable for designation as a bikeway. If none of the above criteria is met, the project should be designed to meet minimum bicycle compatible roadway criteria.

The planner should include a description of the potential significance of the highway facility as a bicycle facility in the project initiation or scoping document that will be forwarded to the project designer. If the planner determines that the project is potentially suitable for



designation as a bikeway, the nature of potential bicycle use should be addressed, including factors affecting roadway design such as highway truck volumes or intersections.

b. Preliminary Engineering

Highway facilities which have been determined through the needs assessment process to be potentially suitable for bikeways should be analyzed to determine physical constraints which may limit the type of facility which could be provided.

The following factors should be considered:

- Does sufficient ROW exist or can additional ROW be acquired to allocate the required space for a bikeway?
- If physical impediments or restrictions exist, can they be avoided or removed to allow the required pavement to provide a bikeway?
- Do bridges allow for bicycle access in accordance with bikeway standards?
- Can travel or parking lanes be reduced in width or eliminated to allow space for bikeways?

If the answer to these questions is positive, a bikeway should be recommended at the completion of the preliminary engineering phase for the following situations:

- Transportation facilities or segments that connect bicycle traffic generators within 8.0 kilometers (5 miles) of each other.
- Segments of transportation facilities that provide continuity with existing bicycle facilities.

If physical constraint factors that preclude allocation of space and designation of bikeways exist, and cannot be avoided or remedied, these factors should be reported to the project manager in the final design phase.

c. Final Design and Facility Selection

When the needs assessment and preliminary design indicate the need for bikeways, the designer should consider traffic operations factors in determining the actual design treatment for the bikeway. The following should be considered in the design of the highway and bicycle facility:

- What are the existing and projected traffic volumes and speeds?
- Does parking exist? Can parking be restricted or removed to allow better sight distances?
- Are intersections/conflict points excessive? Can intersections/conflict points be reduced along roadways in accordance with the New Jersey Highway Access Management Code?
- Can turn lanes at intersections be designed to allow space for bicyclists?
- Can sections with insufficient sight distance or highway geometrics be changed?
- Can traffic operations be changed or “calmed” to allow space for bikeways?

